Quantrol™
by DILLON

Advanced Force Gauge (AFG)
User's Manual

UNITED STATES

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

CANADA

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numeriques de la Class A prescrites dans le Reglement sur le brouillage radioelectrique que edicte par le ministere des Communications du Canada.

EUROPEAN COUNTRIES

WARNING

This is a Class A product. In a domestic environment this product may cause radio interference in which the user may be required to take adequate measures.

CAUTION

Risk of electrical shock. Do not remove cover. No user serviceable parts inside. Refer servicing to qualified service personnel.

Weigh-Tronix reserves the right to change specifications at any time.

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Introduction

Thank you for choosing the Quantrol Advanced Force Gauge (AFG) instrument. With correct use and regular re-calibration it will give many years of accurate and reliable service.

The AFG uses the latest integrated circuit technology. It can measure tensile and compressive forces accurately, while being simple to use by the operator.

Quantrol offers a full range of force measurement products to complement your force gauge, including manual and motorized test stands and a large assortment of grips and attachments. Ask your Quantrol distributor for additional information.

Before Use

Upon receiving the unit please check that no physical damage has occurred to the packaging material, plastic case or the instrument itself. If any damage is evident please notify Quantrol immediately.

Operation Overview

The most commonly used features (such as displaying force, peak hold, zero and changing of displayed units) can all be done by pressing a single dedicated key identified on the front panel with grey text – see the *Basic Functions* section. For less frequently used features, a number of menu "hot keys" are provided so you can press and hold a menu key to access the gauge configuration – see the *Optional Settings* section.

To configure the advanced features of the gauge a full menu-driven system is available by using the keys identified on the front panel with red text – see the *Advanced Menu Options* section.

Powering the AFG for the First Time

Important!
Charge the AFG for 14-16 hours before use.

The AFG is supplied with a set of 5 Nickel Metal Hydride AAA rechargeable batteries. For safety reasons during transportation the batteries are shipped discharged. To obtain maximum battery life we recommend that you charge them with the charger/adaptor supplied for at least 14 -16 hours when you first receive the AFG.

Inserting and Charging the Batteries

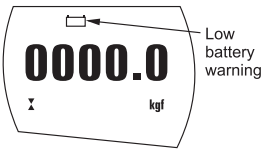
To insert the batteries, remove the battery cover on the upper part of the rear of the gauge by undoing the 3 retaining screws. Fit the five batteries in the battery holder ensuring that you observe polarity and the batteries are placed on top of the release tag.

To remove the batteries simply pull the release tag.

Refit the battery cover and tighten the 3 retaining screws. Connect the AC charger to the AFG charger socket located at the right hand side of the gauge next to the display and charge the batteries for 14-16 hours. Only use the adaptor/charger supplied.

Low Battery Warning

A low battery symbol will appear in the display approximately two minutes before the gauge powers down automatically.



AC operation

Only use the adaptor/ charger supplied.

The AFG can also be powered directly from the AC adapter/charger. You can use the adapter without the batteries present. Connect the AC adapter/charger to your power supply.

If rechargeable batteries are installed, a trickle charge will be applied to the batteries.

Installing alkaline batteries

The AFG can also be powered by five AAA 1.5V alkaline batteries (not supplied).

Warning: When alkaline batteries are installed, the AC adaptor/charger must **NEVER** be connected to the AFG due to the risk of acid leakage which could damage the instrument.

Using the AFG

Fitting Accessories

The Rotary Coupling is supplied with AFG instruments between capacities of 10N to 1000N. It allows you to orientate the gripping accessory without the need for a locking wheel (as on the extension rod).

We do not recommend it to be used for AFG 2.5N and 5N due to its weight, which would need to be tared from the measuring range.

Affix the Rotary Coupling to the male thread of either the short extension rod (1 inch long) or the long

Note: When fitting a grip ensure that it is screwed finger-tight only. Excessive torque can damage the load cell.

extension rod (5 inches long). Affix the extension rod to the load cell probe in the hole at the bottom of the gauge by tightening it gently with the fingers.

Your chosen grip or accessory may now be connected to the rotary coupling.

Mounting to a Test Stand

On the rear of the gauge there are two M5 threaded holes, which can be used for mounting the gauge to a Quantrol test stand. Each Quantrol test stand is supplied with a dedicated dovetailed mounting bracket and screws for this purpose. If you wish to mount to another type of stand, ensure that the screws used are threaded into the gauge to a maximum depth of 0.21 inch. The final thread is peaned but if screws are fitted beyond this depth, damage to the internal PCB may occur.

Powering up

As shown in Figure 1 the control panel has six keys.

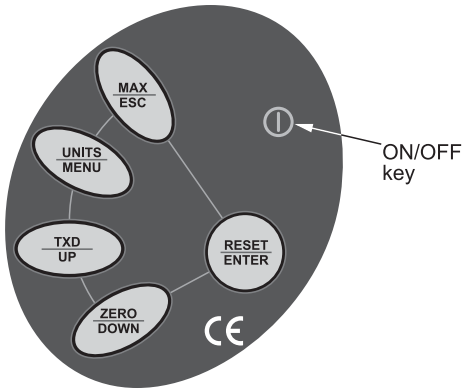


Figure 1
AFG control panel

Please note that an AFG measuring very low forces may not show zero if it is moved during the self test routine. Once it is properly mounted and zeroed the reading will be stable.

To power up the gauge press the red ⏻ key. A short self test runs during which the display will show the model and capacity in Newtons.

After the self test, providing no load has been applied to the instrument, the display will show all zeroes. This is because the gauge rezeroes itself during the self test routine.

If a force is applied via the load cell probe (hole at bottom of AFG), the reading on the display will register the applied force.

* **Do not overload** the load sensor. This will cause irreparable damage. Forces greater than 120% of full-scale will produce an audible beep until load is released and an OL symbol will appear on the display **for 30 seconds**.

Forces greater than 150% of full-scale will produce an audible beep until load is released and an OL symbol will appear *permanently* on the display. Consult your supplier to arrange repair.

All the current settings are saved when the gauge is turned off and the gauge will function in the same mode when powered up again.

To power down the gauge press the red ⏻ key.

Basic Functions

Display of Tension/ Compression

Tensile forces are displayed on the AFG and recognized by the symbol ▲▼

Compressive forces are displayed on the AFG and recognised by the symbol ⧗

If the AFG has suffered a serious overload condition, the load indicator bar will be partially displayed even when no load is present. This is a warning that the load cell is damaged and you should immediately contact your supplier to arrange repair.

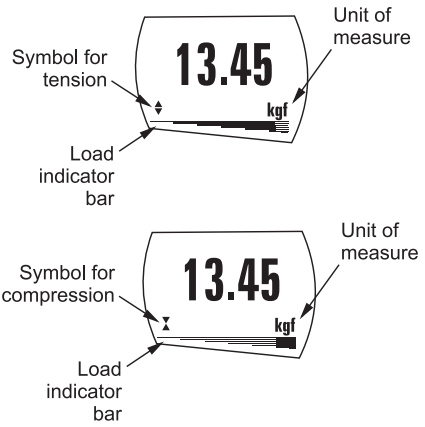


Figure 2
Tension and compression displays

A load indicator bar alerts the operator to how much load has been applied to the load sensor. As the load approaches the maximum rating of the load sensor, the indicator bar changes appearance when above approx. 80% of the rated capacity. This warns you that steps should be taken to prevent excessive load being applied.

For tensile forces the indicator bar is solid then dotted. For compressive forces the indicator bar is dotted then solid. See Figure 2.

Zeroing the Gauge

During the operation of the gauge it is often necessary to zero the display – e.g. when you wish to tare out the weight of a grip, so it does not become part of the measured reading. Press and release the **ZERO** key. The display will blink momentarily as the zero operation is carried out.

Changing the Unit of Measure

You can choose from the following units of measure depending on the capacity of your gauge: milliNewtons, kiloNewtons, Newtons, gram-force, kilogram-force, ounce-force or pound-force.

To change the display units press and release the **UNITS** key. Each successive key press will select the next available units until the gauge returns to its original setting. The AFG automatically converts readings as new units of measure are selected.

Max (peak) Readings

The gauge detects and stores maximum (peak) force in both compressive and tensile directions.

"Max" Mode

Press the **MAX** key. The display will show the word *MAX* together with the highest tensile force and the highest compressive force detected during the test. The current load being applied to the load sensor is also displayed. See Figure 3a.

Press the **MAX** key again and the display will show the maximum tensile force identified by the symbol ⧫. Press the **MAX** key again and the display will show the maximum compressive force identified by the ⧗ symbol.

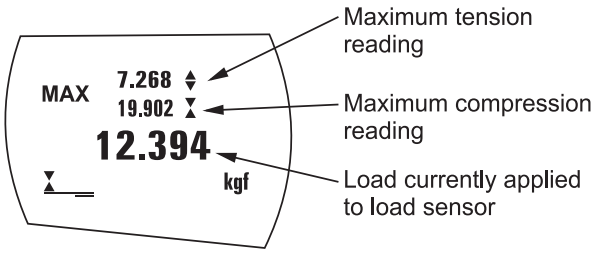


Figure 3a
Dual Max

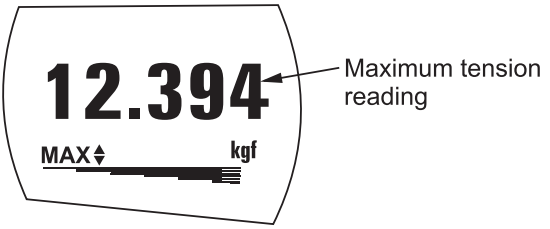


Figure 3b
Max Tension

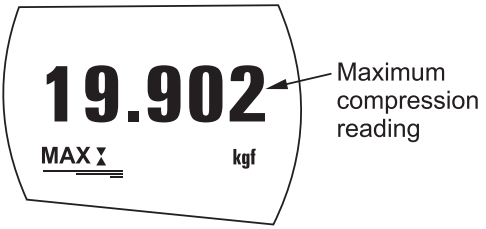


Figure 3c
Max Compression

"Normal" mode

Press the **MAX** key again and the word *MAX* has now disappeared from the display. The display will now indicate forces applied in both directions as they are applied to the load sensor and maintain a live display.

Press the **RESET** key to clear both maximum registers and prepare for detecting the next maximum readings.

Data Output

(See also *COMMS* section of *Advanced Menu Options*)

Analog output

A calibrated analog output is available from the top 'D type' connector. See *Specifications* for details.

RS232 and Mitutoyo output signals

It is possible to transmit the displayed reading to peripheral devices (e.g. PC, printer) by pressing and releasing the TXD key. Displayed readings can also be requested individually from a PC via the RS232 interface by sending a"?" (ascii D63 [3fh] character).

Continuous PC Communication

For sending a continuous data stream to a PC, press and hold the **TXD** key for 2 seconds then release. *TX* will now appear in the display to indicate that data is being sent. To stop sending data, simply press and release the *TXD* key, at which point *TX* will disappear from the display.

AFG uses 2400, 9600, 57600 or 115200 Baud, 8 data bits, 1 start bit, 1 stop bit and no parity. (See Advanced Menu Options for setup details)

A full range of data cables are available to connect your gauge to peripheral devices – contact your supplier.

Capable of continuous data up to 100Hz.

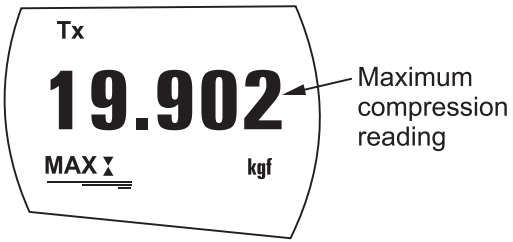


Figure 4

Please note that the continuous data stream only starts when approx. 2% of the rated capacity of the gauge is reached. This feature prevents collection of large amounts of data at insignificant loads.

Optional Settings

Backlit Display

The AFG has a display backlight that can be turned on at powerup. Press and hold **UNITS** while powering up the AFG with the ⏻ key. The backlight is now operating.

Please note that battery consumption is doubled when using the backlight. For this reason the backlight setting **is not** remembered after power down.

Auto-off

An Auto-off feature can be enabled to conserve battery power where the gauge powers down after 2 minutes since the last key press.

Press and hold **ZERO** while powering up the AFG with the ⏻ key. The symbol *Ao* will appear in the display to indicate Auto-off is active. This feature is remembered after power down.

Invert Display

The display may be inverted or “reversed”, so that the operator can read it more comfortably. Press and hold the **MAX** key while powering up the AFG with the ⏻ key to invert the display. This feature is remembered after power down.

Factory Default

The AFG may be returned to its original factory default settings, shown in the *Advanced Menu Options* section of this manual.

Press and hold the **RESET** key while powering up the AFG with ⏻ the key.

Additional Force & Torque Sensors

The AFG has an interchangeable loadcell cartridge (ALC), which allows selection of different capacity load cells to be fitted to the AFG console.

Interchangeable Advanced Loadcell Cartridges (ALC)'s

To exchange the cartridge, power down the gauge and remove it from the test stand if it is fitted to one. Turn the gauge face down and insert a 3mm Allen key (supplied) into the boss on the back of the ALC. To unlock the ALC rotate the boss anti-clockwise with the Allen key through approximately 30º to release the spring loaded locking cam. While still holding the Allen key in position slide the ALC away from the AFG console to the left. See Figure 5.

Warning! *The AFG must be powered down when connecting or disconnecting smart load sensors.*

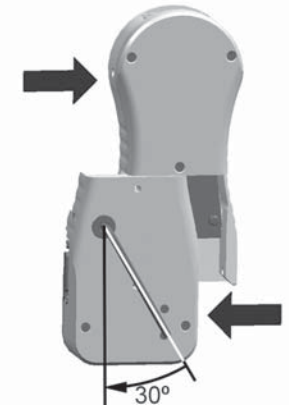


Figure 5
Removing ALC

To fit the new ALC, first insert the Allen key into its boss and rotate the locking cam as above. Slide the ALC into the AFG console, ensuring that the mating surfaces are correctly aligned.

Warning! *Incorrect alignment of the ALC may lead to damage to the ALC interface pins.*

Push the ALC firmly home into the AFG console and, to lock it, tighten the locking cam by rotating the Allen key clockwise until slight pressure is felt. Take care not to over tighten the locking cam.

'Smart' Sensors

Warning! *The AFG must be powered down when connecting or disconnecting smart load sensors.*

All Advanced Loadcell Cartridges have a 15-pin 'Smart' connector port on the right hand side for interface with Quantrol external 'Smart' force and torque sensors. This allows you to use your existing AFG console to perform additional tests without the need for a dedicated instrument.

To connect a 'Smart' sensor, power down the gauge and plug in the 'Smart' force or torque sensor to the 15-pin 'Smart' port. Power on the AFG. The 'Smart' load sensor will be automatically recognized and the capacity displayed.

Loadcell Diagnostic Test

An instrument showing an overload condition cannot be relied upon to provide accurate, repeatable measurement –consult your Quantrol distributor.

If you suspect that your ALC loadcell or 'Smart' sensor has sustained an overload it is possible to check the status of the sensor immediately.

Symptoms of overload may be (a) OL in display (b) buzzer sound (c) probe not aligned perpendicularly to gauge (d) load indicator bar present even under zero load.

See *Calibration* section of *Advanced Menu Options* to check load cell status.

Advanced Menu Options

All the features and advanced menu options of the AFG are also applicable while using the 'Smart' range of peripheral devices.

The AFG Advanced Menus are accessed using the red text on the keys.

Navigating the menus

See the Appendix in the back of this manual for flowcharts of all the menus.

Press and hold the **MENU** key for approximately 2 seconds to access page 1 of the main menu. To move between the options listed on the 2 main menu pages, press **UP** and **DOWN** to move the cursor. Press **ENTER** to select sub-menus, activate features and enter values. Within sub-menus **UP** and **DOWN** will also change numerical values. Press **ESC** to return to page 1 of the main menu page.

If **ALARM** is selected in page 1, by pressing **ENTER** the status of all the other functions can be seen by consecutively pressing the **MENU** key to scroll through the functions one at a time. Press **ESC** once to return to the main menu page and twice to return to the main display.

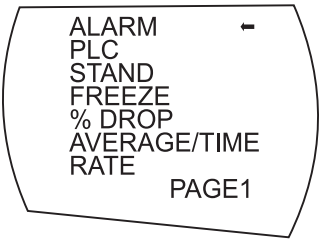


Figure 6
Main Menu

ALARM

The AFG has an audible and visual alarm feature which can be set to trigger on pass, fail or sample break criteria.

To set an alarm, press and hold the **MENU** key until page 1 of the main menu appears. The cursor arrow will point to *ALARM*. Press the **ENTER** key.

ALARM sub-menu 1

The display will show *ALARM OFF* and *SET*.

Press ENTER to change *ALARM OFF* to *ALARM ON*.

Press **DOWN** to move the arrow cursor to *SET* and press **ENTER**.

ALARM sub-menu 2

The display will now show the two limits *LIMIT 1* (lower limit) and *LIMIT 2* (upper limit) plus the value they are set to and whether they are in tension (*TENS'N*) or compression (*COMP'N*). A diamond cursor will indicate which value is selected. Use **UP** and **DOWN** keys to change the value, press and hold to scroll values. When the correct value is reached press **ENTER** to set *LIMIT 1*. Repeat procedure for *LIMIT 2*.

The alarm limits are not active below 1% of the capacity of the gauge.

Figure 7
Menu page 1

ALARM sub-menu 3

The display shows *AUDIBLE*, *LED* and *BOTH* with the arrow cursor indicating which feature is selected. This menu selects how the PASS/FAIL status of a value will be indicated.

AUDIBLE	Only the audible alarm will be activated when the value is a PASS/FAIL
LED	The green and red LED's will indicate the PASS /FAIL status.
BOTH	Both the LED and the audible alarm will be activated above.

Use UP and DOWN to move the cursor and press ENTER to select the desired feature.

ALARM sub-menu 4

The display shows *OUT BAND* and *IN BAND*. This menu selects which values are to be considered.

OUT BAND	Any value falling outside the set limits LIMIT 1 and LIMIT 2
IN BAND	Any value falling between the set limits LIMIT 1 and LIMIT 2

Use **UP** and **DOWN** to move the cursor and press **ENTER** to select the desired feature.

ALARM sub-menu 5

The display shows *PASS* and *FAIL*. This menu sets the OUT BAND and IN BAND mode.

PASS	Values, which fall either OUT BAND (or IN BAND, if selected), are a PASS
FAIL	Values, which fall either OUT BAND (or IN BAND, if selected), are a FAIL and will cause an audible beep.

Use **UP** and **DOWN** to move the cursor and press **ENTER** to select the desired feature.

Display is showing sub-menu 1 again (= ALARM ON and SET). Press **ESC** to return to main menu and again to return to main display. The main display will now show an alarm 'bell' symbol indicating the alarm is turned on. See Figure 8.

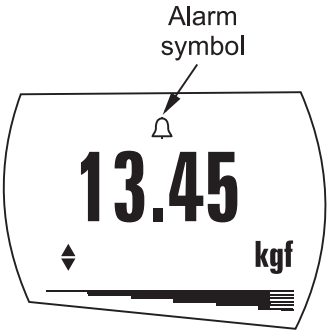


Figure 8
Alarm symbol

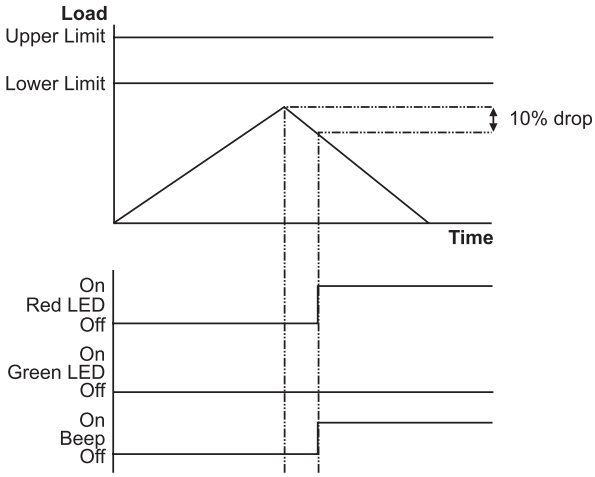
ALARM on break

This feature is only activated when the % DROP feature is used in conjunction with the ALARM function. The AFG looks for a percentage (of full-scale) drop from peak load value, set in the % DROP menu. The alarm can be used to indicate if the break point falls inside or outside the limits LIMIT 1 and LIMIT 2 set in the alarm menu (see Examples 1 to 5).

Example 1

Settings: -

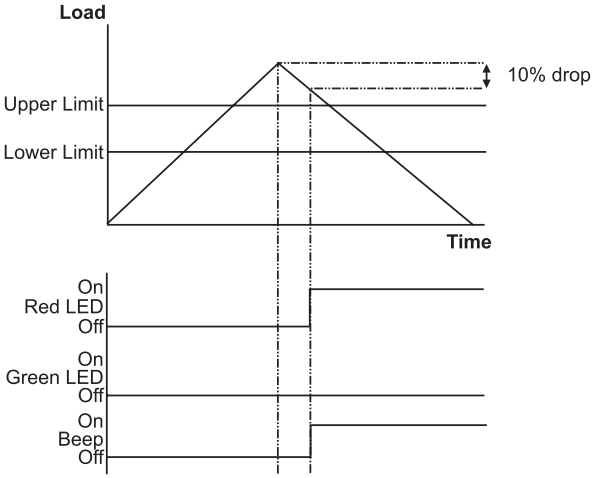
- *BOTH LED and audio alarms are active*
- *Alarm triggers on OUT BAND*
- *Alarm is set to FAIL*
- *% DROP is 10% of fullscale (e.g. AFG 100N must register drop of 10N)*
  Main display is set to 1st peak tension screen



Example 2

Settings: -

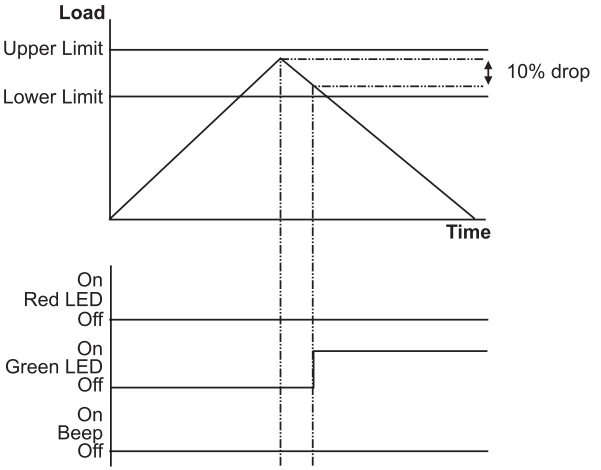
- *BOTH LED and audio alarms are active*
- *Alarm triggers on OUT BAND*
- *Alarm is set to FAIL*
- *% DROP is 10% of fullscale (e.g. AFG 100N must register drop of 10N)*
  Main display is set to 1st peak tension screen



Example 3

Settings: -

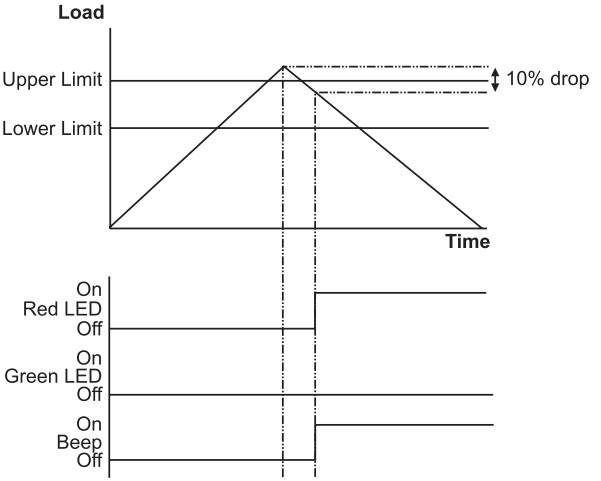
- *BOTH LED and audio alarms are active*
- *Alarm triggers on OUT BAND*
- *Alarm is set to FAIL*
- *% DROP is 10% of full-scale (e.g. AFG 100N must register drop of 10N)*
  Main display is set to 1st peak tension screen



Example 4

Settings: -

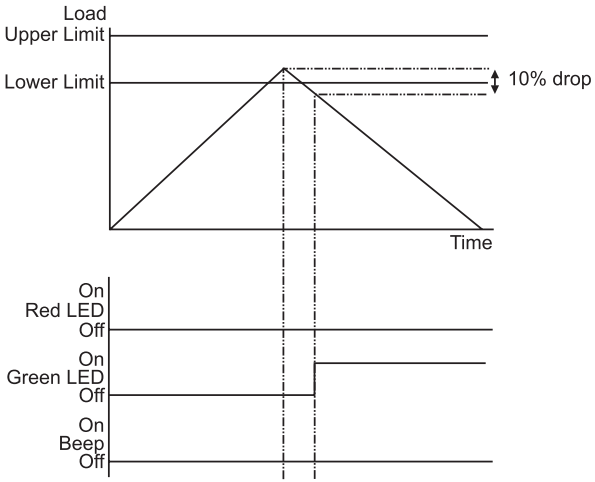
- *BOTH LED and audio alarms are active*
- *Alarm triggers on OUT BAND*
- *Alarm is set to FAIL*
- *% DROP is 10% of full-scale (e.g. AFG 100N must register drop of 10N)*
  Main display is set to 1st peak tension screen



Example 5

Settings: -

- *BOTH LED and audio alarms are active*
- *Alarm triggers on OUT BAND*
- *Alarm is set to FAIL*
- *% DROP is 10% of fullscale (e.g. AFG 100N must register drop of 10N)*
  Main display is set to 1st peak tension screen



PLC (Programmable Limit Controller)

The AFG has a load output signal which may be used for PLC applications. For PLC applications, this function requires an external cable with a built-in solid-state relay – see *Specifications* for details of the signal.

To configure the signal output from the AFG, press and hold the **MENU** key until page 1 of the main menu appears. Press **DOWN** to move the arrow cursor to *PLC* and press the **ENTER** key. The cursor arrow now points to *PLC OFF*.

PLC sub-menu 1

The display will show:

PLC OFF	Indicates PLC function status.
RESET	When the load limit is reached, the output signal triggers the relay and the RESET key must be pressed to clear the line before starting the next test.
CONTINUOUS	The relay will be activated every time the load limit is reached and the output signal will remain on.
PULSE	The relay will be activated momentarily when the load limit is reached.

Select the desired function and press the **ENTER** key.

PLC sub-menu 2

The display will show *SET* and a default load limit at which the output signal will trigger the relay.

To set the required load limit use **UP** and **DOWN** keys to adjust the value and **ENTER** to confirm the selection.

The display will revert back to PLC sub-menu 1 and *PLC ON* will now be displayed.

STAND

Contact your supplier for stand interface cable

The AFG may be used to send a signal to control the Quantrol range of motorized test stands via a dedicated cable.

To configure the signal output from the AFG, press and hold the **MENU** key until page 1 of the main menu appears. Press **DOWN** to move the arrow cursor to *STAND* and press the **ENTER** key.

STAND sub-menu 1

The display will show:

STAND OFF	Stand control function not enabled.
REVERSE	Reverses the stand direction of travel at sample break (BREAK) or load-limit value (LIMIT). The test stand will reverse back to the start position as defined by the physical limit switch.
STOP	Stops the stand at sample break (BREAK) or load-limit value (LIMIT). The test stand does not return to the start position until physically commanded by the operator.
CYCLE	Cycles a suitable test stand between load limits (UPPER, LOWER) for a set number of times (CYCLE).

Stand STOP and CYCLE are new functions which require newer test stands. Consult with your Quantrol distributor if compatibility is in question.

Select the desired function using **UP** and **DOWN** keys and press **ENTER** to select.

You must press the RESET key after you perform a REVERSE, STOP or CYCLE test.

REVERSE sub-menu 1

Select *UP* or *DOWN* to tell the gauge which direction the stand will begin to move before the load-limit is reached.

REVERSE sub-menu 2

BREAK - Sets the gauge to reverse at sample break. Press **ENTER** to select.

Break sub-menu 1

SET % of load cell capacity to indicate the value by which the load must fall to determine a break. Use a higher percentage for 'noisy' samples where the load may fluctuate before the sample finally breaks.

Press **ENTER** to confirm selection and return to stand submenu 1.

Limit sub-menu 1

LIMIT - Sets the load-limit value to trigger the stand reverse function. Press **ENTER** to select.

SET load-limit using **UP** and **DOWN** keys. (**UNITS** key changes the units of measurement for load-limit value). Press **ENTER** to confirm selection and return to stand sub-menu.

STOP sub-menu 1

Select *BREAK* or *LIMIT* as per Reverse sub-menu 2 (above) and SET the appropriate value at which you require the test stand to stop.

CYCLE sub-menu 1

It is assumed that starting a test in the UP direction applies a tension force, and in the DOWN direction applies a compression.

The total number of cycles must be completed. e.g. if a sample breaks during the test, the AFG will try to continue applying load for the set number of cycles.

At the end of your cycle test, the test sample will still be under load.

Select and SET UPPER load-limit, LOWER load-limit and the number of CYCLES you wish to perform (range = 1- 9999). Start the test by pushing the UP or DOWN switch on your test stand. The test stand will move to the UPPER load-limit and then travel back to the LOWER load-limit to perform the first cycle. Subsequent cycles will be performed and a cycle-counter is shown on the main display. See notes at left.

When one of the stand control options (REVERSE, STOP or CYCLE) have been set, press **ENTER**. The display will revert back to *STAND* sub-menu 1 and *STAND ON* will now be displayed. Press **ESC** to return to the main menu page 1.

It is recommended to press **RESET** after each STAND operation.

FREEZE

Key:
1 = 5.0 V
0 = 0.0 V

This feature is used to 'freeze' the main-display when an external signal is received. The AFG can be configured to freeze when going either low 1-0 (LO) or high 0-1 (HI). This is particularly useful for applications where a significant event occurs which must be captured (e.g. force required for switch closure). To clear the main menu display press **RESET**.

To configure this function, press and hold the **MENU** key until page 1 of the main menu appears. Press **DOWN** to move the arrow cursor to *FREEZE* and press the **ENTER** key.

FREEZE sub-menu 1

Select the desired LO or HI function using **UP** or **DOWN** arrow keys and press **ENTER** to select. When set the submenu will display *FREEZE ON*. To disable the FREEZE function, press **ENTER**. *FREEZE OFF* will now be displayed. Press **ESC** to return to main menu page 1.

A signal must be provided to the AFG through pins 7 and 10. See specifications.

% DROP

1st Peak facility – this is used to detect the force at which a sample breaks but is not necessarily the maximum force (e.g. detecting the force at which a tablet first begins to crack) or in capturing yield point of a material.

When this feature is set to *ON*, two additional functions can be selected using the **MAX** key from the main display.

Figure 9
1st Peak
Tension

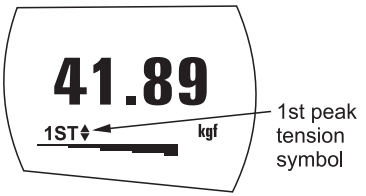
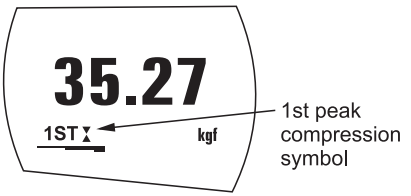


Figure 10
1st Peak
Compression



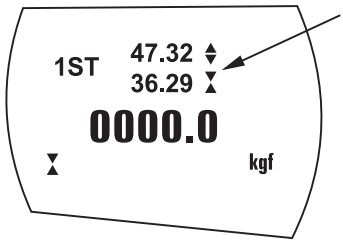


Figure 11
1st Peak Tension and Compression

% DROP sub-menu 1

The display will show *% DROP OFF* and *SET*. Press **ENTER** to change *% DROP OFF* to *% DROP ON*. Press **DOWN** to move the arrow cursor to *SET %* and press **ENTER**.

% DROP sub-menu 2

To determine what precisely is considered a break, you must define the % drop of full-scale value from the peak load observed prior to the break occurring.

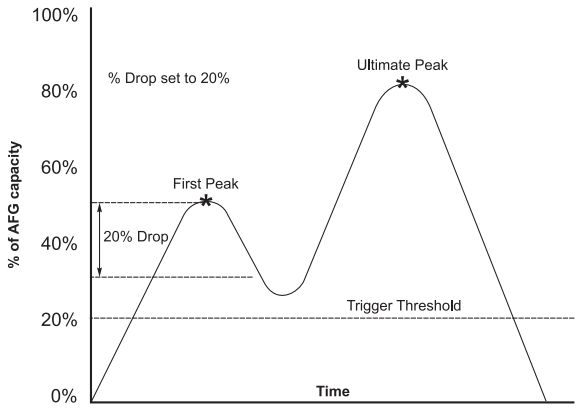
To set the required % drop use **UP** and **DOWN** keys to adjust the value and press **ENTER** to confirm the selection.

The % drop value selected also acts as a threshold, below which the % drop function will not be active.

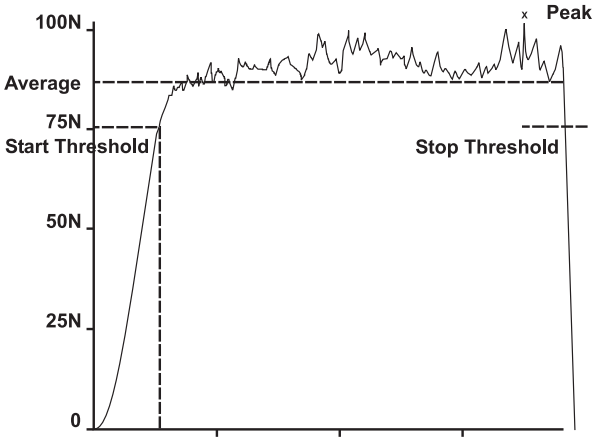
EXAMPLE

AFG 100N has % drop of 20 (= 20N). If the peak load before sample break is 50N, the load must drop to 30N in order for the AFG to detect a 1st peak of 50N. If load continues to be applied above 50N (e.g. to 75N), the AFG will return 75N as MAX and 50N as 1st peak.

This test would produce a first peak result.



Average/Time



This function allows the average load reading to be displayed. The average starts being calculated when the threshold (% of full-scale) is reached and stops being calculated when the load falls back below this threshold.

To set AVERAGE over TIME, press and hold the **MENU** key until page 1 of the main-menu appears. Using **UP** and **DOWN** move the cursor key to *AV/TIME*. Press the **ENTER** key.

Avg/Time sub-menu 1

The display will show *AVERAGE/TIME OFF* and *SET*. Press **ENTER** to change *AVERAGE/TIME OFF* to *AVERAGE /TIME ON*. Press **DOWN** to move the arrow cursor to *SET* and press **ENTER**.

Avg/Time sub-menu 2

Define a % value of full-scale as the threshold value in the SET menu. Any load reading above this threshold will be averaged over time with all the previous readings occurring since the threshold value was exceeded. Averaging stops when load readings fall back below the threshold.

Press **ESC** to return to main menu.

RATE

This function selects the display throughput rate, i.e. the amount of averaging performed by the internal electronics before the load reading is displayed. There are three levels HI, MED and LO.

HI Display updates quickly with little data averaging (2000 Hz)

MED Gauge default. (10 Hz)

LO Maximum data averaging before values are displayed. Smoothes 'noisy' data. (2 Hz)

To set *RATE*, press and hold the **MENU** key until page 1 of the main menu appears. Using **UP** and **DOWN** move the arrow key to *RATE*.

Using **UP** and **DOWN** select the relevant level (*HI*, *MED* or *LO*) and press the **ENTER** key.

Press **ESC** to return to page 1 of the main-menu.

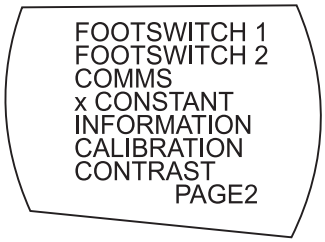


Figure 12
Main menu, page 2

From page 1 of main-menu press MENU to scroll to page 2 of the main menu. See Figure 12.

FOOTSWITCH 1

The AFG has two footswitch input pins on the 15-pin D connector. This allows a footswitch to be assigned to perform any of the five main key functions, **MAX**, **UNITS**, **TXD**, **ZERO** and **RESET**.

This feature is useful when integrating the AFG into test or production systems.

To assign the function of a key to FOOTSWITCH 1 use **UP** and **DOWN** to move the arrow key to *FOOTSWITCH 1*. Using **UP** and **DOWN** select the relevant key (*MAX*, *UNITS*, *TXD*, *ZERO* or *RESET*) and press the **ENTER** key. Press **ESC** to return to page 2 of the main-menu.

FOOTSWITCH 2

To assign the function of a key to FOOTSWITCH 2 use **UP** and **DOWN** to move the arrow key to *FOOTSWITCH 2*. Using **UP** and **DOWN** select the relevant key (*MAX*, *UNITS*, *TXD*, *ZERO* or *RESET*) and press the **ENTER** key. Press **ESC** to return to page 2 of the main-menu.

COMMS

Communications settings are selected to configure interface of the AFG with peripheral devices. Also used to configure the AFG internal database which can store up to a maximum of 100 readings in the internal memory.

To set communications first use **UP** and **DOWN** keys to move the cursor arrow to *COMMS* on page 2 of the main menu.

COMMS sub-menu 1

Using **UP** and **DOWN** select the relevant option (see below) and press the **ENTER** key.

PORT	Communicates with peripheral device. Transmission of the displayed load reading can be set to include unit of measurement (UNITS ON or OFF) and BAUD rate can also be set.
STORE MEM	Stores the present load reading to the internal memory, whether live or peak. Up to 100 readings may be stored in the memory. As each reading is stored, a *REC* symbol appears on the main display to indicate a reading has been stored in memory.
SEND MEM	Sends all load readings stored in the internal memory to a peripheral device (e.g PC or data logger).
CLEAR MEM	Erases all load readings stored in memory.

When setting *PORT* you will now access sub-menu 1.

Port sub-menu 1

Transmission of the displayed load reading can be set to include the unit of measurement (*UNITS ON* or *OFF*). Use the **UP** or **DOWN** key to position the arrow cursor at either *UNITS OFF* or *ON*. Press **ENTER** to select.

Port sub-menu 2

The transmission (or Baud) rate can now be set.

Use the **UP** or **DOWN** key to position the arrow cursor at the relevant speed (2400, 9600, 57600 or 115200). Press ENTER to select.

You will now return to page 2 of the main menu.

To set STORE MEM press **ENTER** from Comms sub-menu 1. This will cause a memory counter to appear in the main display. You will now return to page 2 of the mainmenu.

To set SEND MEM press **ENTER** from Comms sub-menu 1. This will cause a TX symbol to flash in the main display as the memory data is now transmitted to a peripheral device. The data is transmitted at the settings defined by PORT. After transmission of data you will now return to page 2 of the main-menu.

To set CLEAR MEM press **ENTER** from Comms sub-menu 1. This now erases all the data stored in the memory. The memory counter is now reset to zero. After clearing the memory you will now return to page 2 of the main-menu.

INFORMATION

Displays calibration information.

T - Tension span

C - Compression span

Z - Current zero

G - Gravitational constant

This is for information only and may be required for diagnostic purposes by your distributor.

CALIBRATION

Calibration menu - displays a password menu and allows the user to check for load cell offset if overload is suspected.

Place the gauge (or your external SMART sensor) horizontally on a flat level surface. By using UP or DOWN keys select the CAL option and the display will show 0000. Press **ENTER** four times (to enter 0000 as the password), a screen showing initial (at calibration) load cell offsets and current offset in % is displayed.

The upper value shows the % offset when the gauge was last successfully calibrated. The lower value shows the % offset currently present on the gauge.

If the current % offset is as shown below, follow the appropriate action.

Lower Value	Action
-4.9% to 4.9%	Normal offset provided upper and lower values are within 5% of each other
-5.0% to -9.9% 5% to 9.97%	Contact Quantrol distributor for recalibration
-10% and greater 10% and greater	Contact Quantrol distributor for loadcell replacement

These values are given as an indicator only – the need for calibration/repair may vary according to the individual characteristics of the load cell.

x/CONSTANT

Press and hold **ESC** until you return to page 2 of main menu.

A constant of multiplication can be applied to the load values in the main display. This is useful for applications where you wish to convert the load reading into a non-standard unit of measurement e.g. for coefficient of friction tests.

Press **ENTER** to select *xCONSTANT*. Press **UP** or **DOWN** to adjust the constant of multiplication. Press **ENTER** to confirm.

CONTRAST

The contrast of the display may be increased and decreased in this menu.

From page 2 of main menu press **UP** or **DOWN** keys to position the arrow key on *CONTRAST*. Press **ENTER** to select *CONTRAST* menu and 1.234 will be displayed. Press **UP** or **DOWN** to adjust the contrast of the display and **ENTER** to confirm the setting. You will now return to page 2 of the main menu.

AFG Specifications

Range & Resolution

Model no:	mN	N	kN	gf	kgf	ozf	lbf
AFG2.5	2,500 x 0.5	2.5 x 0.0005	-	250 x 0.05	-	9 x 0.002	0.55 x 0.0001
AFG 5	5,000 x 1	5 x 0.001	-	500 x 0.1	0.5 x 0.0001	18 x 0.005	1.1 x 0.0002
AFG 10	10,000 x 2	10 x 0.002	-	1,000 x 0.2	1 x 0.0002	35 x 0.01	2.2 x 0.0005
AFG 25	25,000 x 5	25 x 0.005	-	2,500 x 0.5	2.5 x 0.0005	90 x 0.02	5.5 x 0.001
AFG 50	50,000 x 10	50 x 0.01	-	5,000 x 1	5 x 0.001	180 x 0.05	11 x 0.002
AFG 100	-	100 x 0.02	-	10,000 x 2	10 x 0.002	350 x 0.1	22 x 0.005
AFG 250	-	250 x 0.05	-	25,000 x 5	25 x 0.005	900 x 0.2	55 x 0.01
AFG 500	-	500 x 0.1	-	50,000 x 10	50 x 0.01	1,800 x 5	110 x 0.02
AFG 1000	-	1,000 x 0.2	1 x 0.0002	-	100 x 0.02	3,500 x 1	220 x 0.05

ACCURACY

± 0.1% of full-scale

Calibration temperature: 20°C ± 2°C

Operating temperature: 10°C - 35°C

Temperature shift at zero load: ± 0.01% of full-scale/°C

OUTPUT

RS232-C: 8 data bits, 1 Start bit, 1 Stop bit, no parity

Digimatic (Mitutoyo) format: BCD output

Analogue: 0 to +4V full scale for tension (or clockwise)

0 to -4V full scale for compression (or counter-clockwise)

(calibrated to order at factory)

PLC Signals: Relay description:

The solid-state relay is mounted on a PCB,which is housed in a 15 pin D-type connector. Connection to the relay output is via a 15 foot jacketed cable. The end of the cable is left with bare wires to allow appropriate termination to the peripheral PLC device.

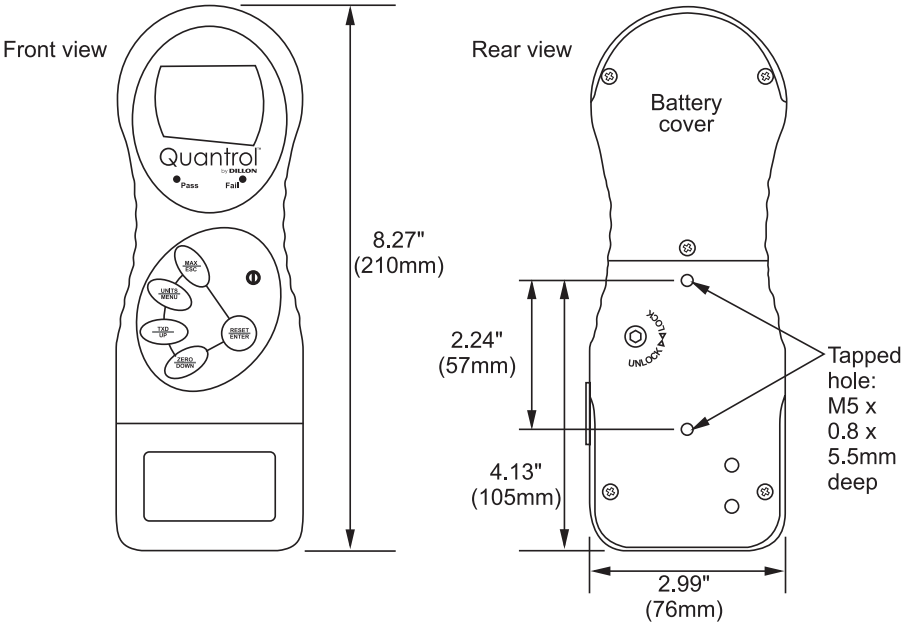
Peak Capture Rate: 2,000 Hz

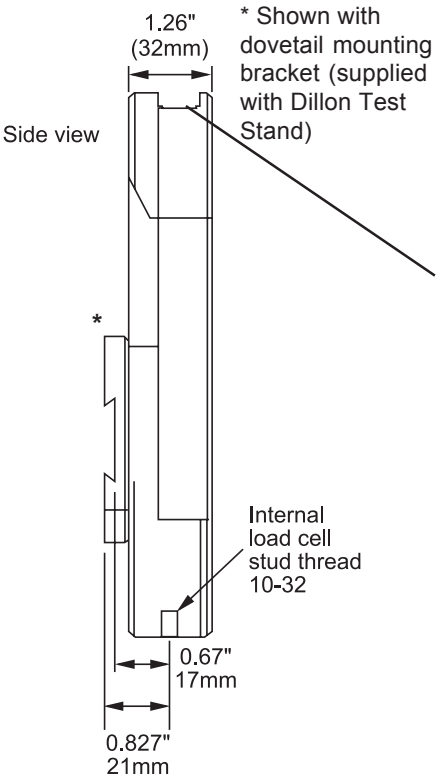
PLC Cable

Supply voltage: The relay is powered from a 5 volt regulator inside the AFG Input control: The relay state is controlled via a TTL signal from the AFG and is in a “closed position” when a logic ‘1’ input is applied.

Output characteristics

Peak relay ac voltage:	350 volts
Continuous relay load current or peak ac voltage:	120 mA
Maximum relay peak load current:	300 mA
Typical relay contact resistance at 100 mA:	17 ohms
Isolation voltage between AFG and relay output:	1500 volts AC





AFG Mk 3 D Connector Pin Out:	
1*	Analog Output
2	RS232 Transmit
3	RS232 Receive
4	Mitutoyo Clock Output
5	Mitutoyo Ready Output
6	+ 5 Volts
7*	FREEZE Reading Input
8	Stand Reverse UP
9*	Footswitch 2 Input/SMART -ve out
10	Ground
11	Mitutoyo Request Input
12	Mitutoyo DATA Output
13*	Footswitch 1 input
14*	PLC Output
15	Stand reverse DOWN

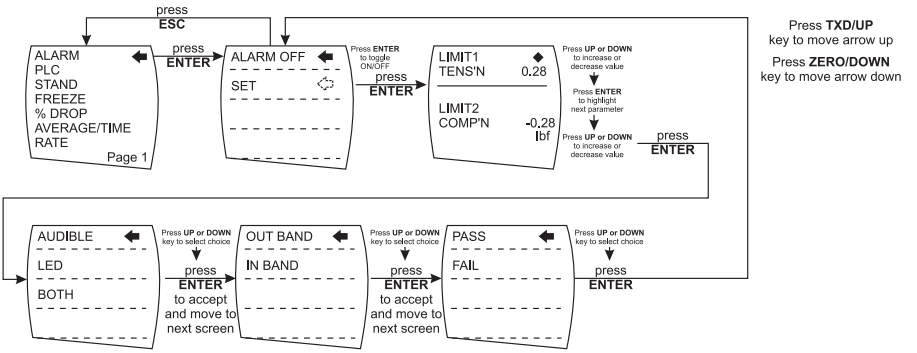
Allocation for the pins on the Male 15-pin D-type communication connector.

* Uses ground (pin 10) to complete circuit.

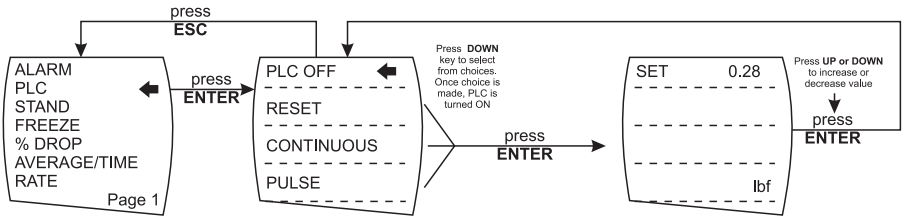
Appendix: Menu Flowcharts

On the following pages are flowcharts to help you navigate the menus found in the AFG. They appear in the order they appear on the two pages of the main menu.

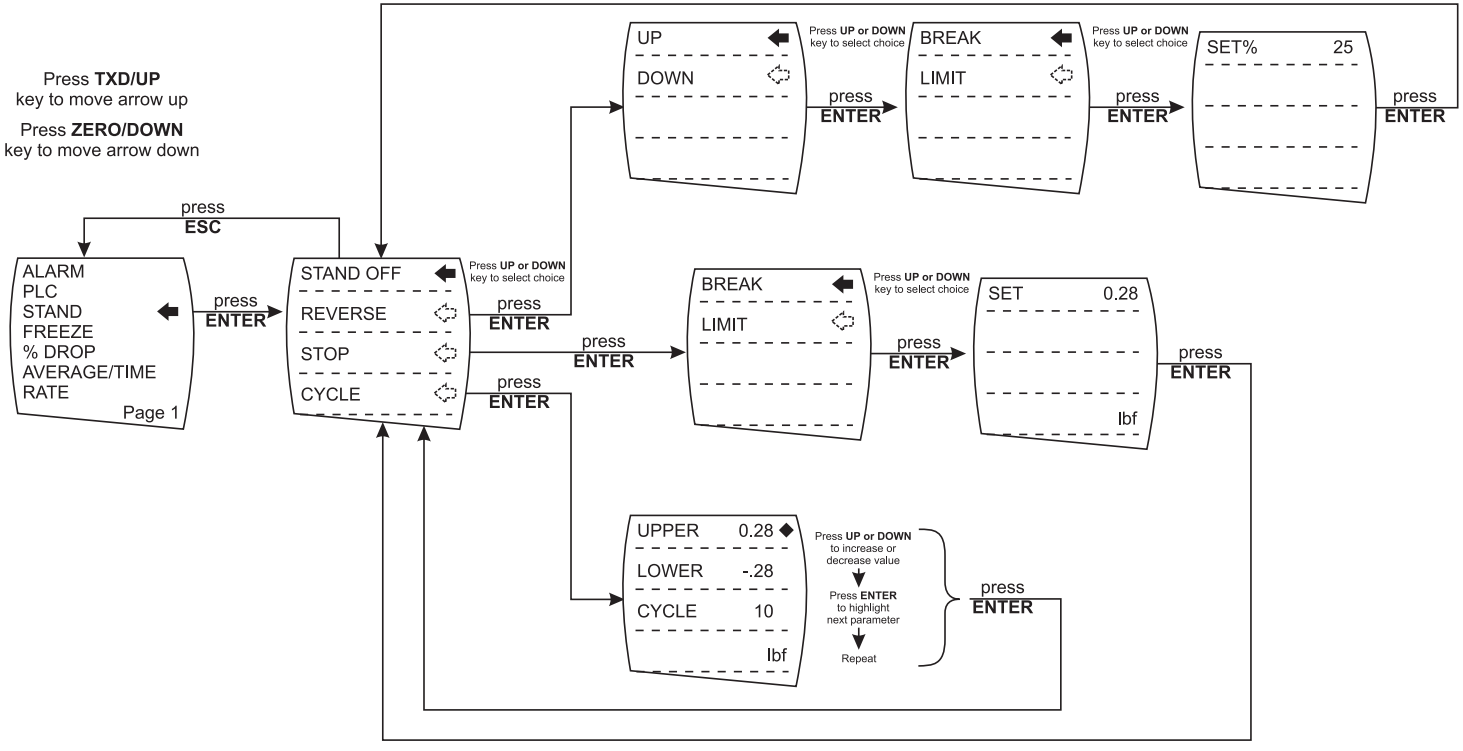
Alarm



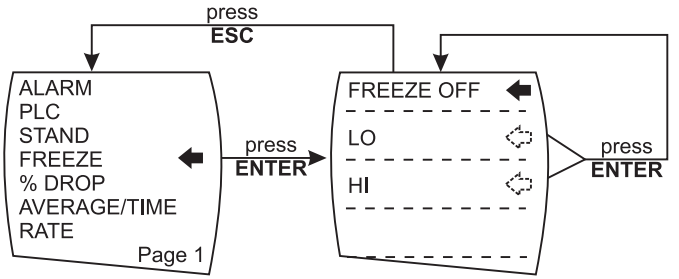
PLC



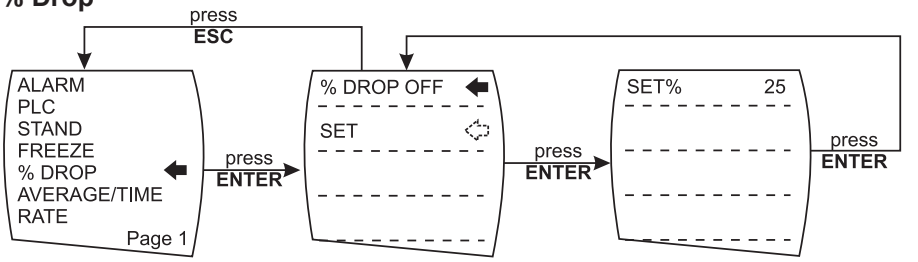
Stand


Press **TXD/UP** key to move arrow up
Press **ZERO/DOWN** key to move arrow down
press **ESC**
ALARM
PLC
STAND
FREEZE
% DROP
AVERAGE/TIME
RATE
Page 1
press **ENTER**
STAND OFF
REVERSE
STOP
CYCLE
Press **UP or DOWN** key to select choice
press **ENTER**
UP
DOWN
Press **UP or DOWN** key to select choice
press **ENTER**
BREAK
LIMIT
Press **UP or DOWN** key to select choice
press **ENTER**
SET% 25
press **ENTER**
press **ENTER**
BREAK
LIMIT
Press **UP or DOWN** key to select choice
press **ENTER**
SET 0.28
lbf
press **ENTER**
press **ENTER**
UPPER 0.28
LOWER -.28
CYCLE 10
lbf
Press **UP or DOWN** to increase or decrease value
Press **ENTER** to highlight next parameter
Repeat
press **ENTER**

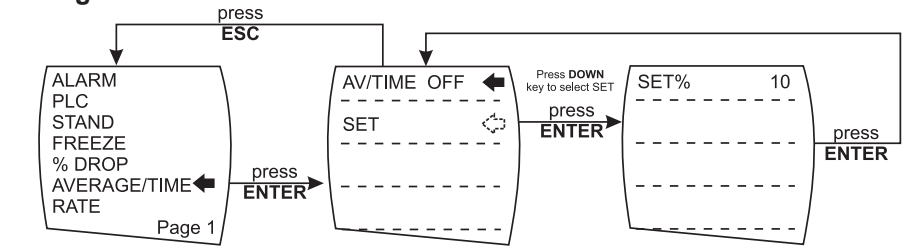
Freeze



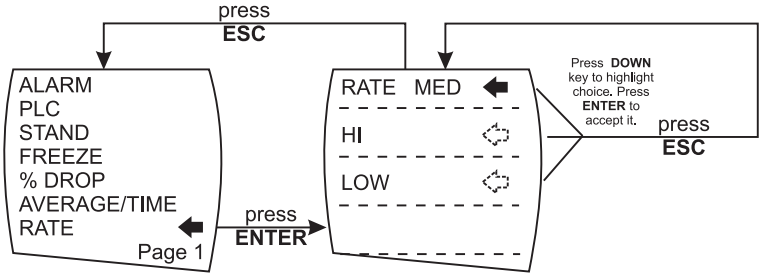
% Drop



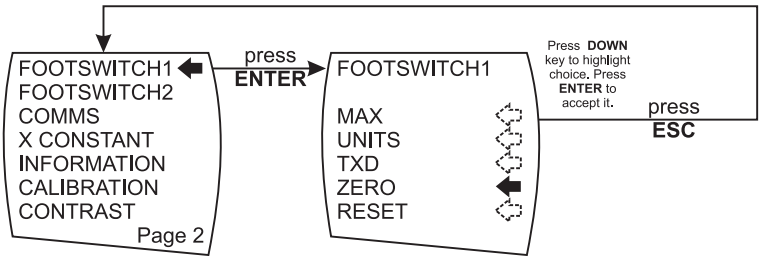
Average/Time



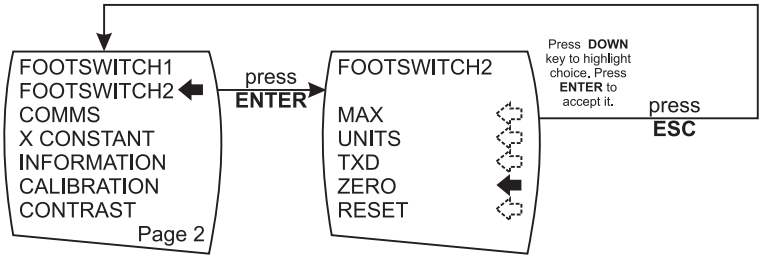
Rate



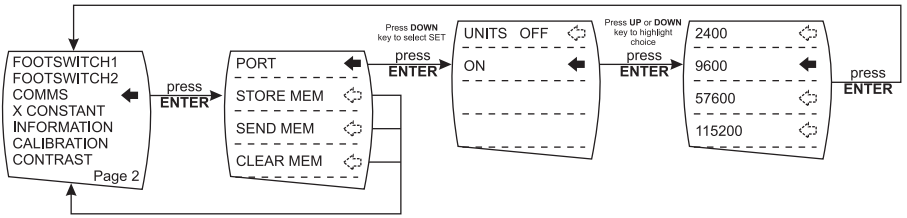
Footswitch1



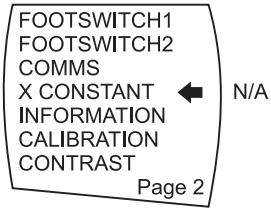
Footswitch2



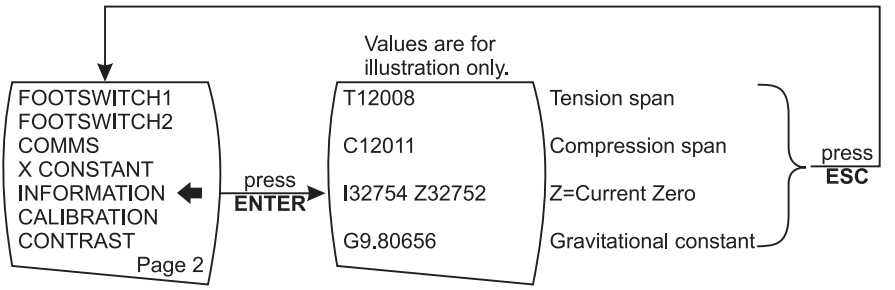
Comms



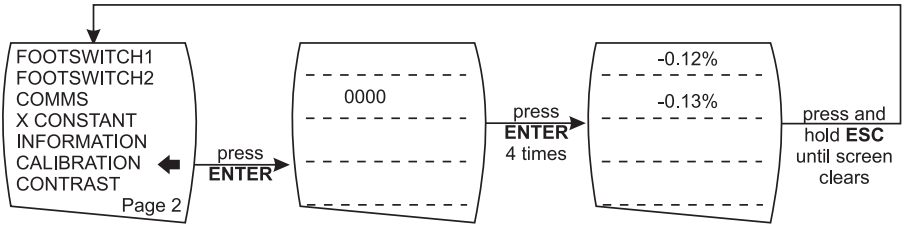
Constant



Information



Calibration



Contrast

Distributor / Sales / Service & Calibration

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